

European Hydrogen Emergency Response training programme for First Responders



Overview of HyResponse educational training programme

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International Workshop on Hydrogen Safety Training for First Responders

3-4 September 2014, Aix-en-Provence, France

Content



- Overview of European Hydrogen Safety Training Platform (EHSTP)
- Role of educational segment of EHSTP
- International Curriculum on Hydrogen Safety training for First Responders
- Planned pilot training sessions
- Teaching materials and online training course
- HyResponse website



European Hydrogen Safety Training Platform (EHSTP)

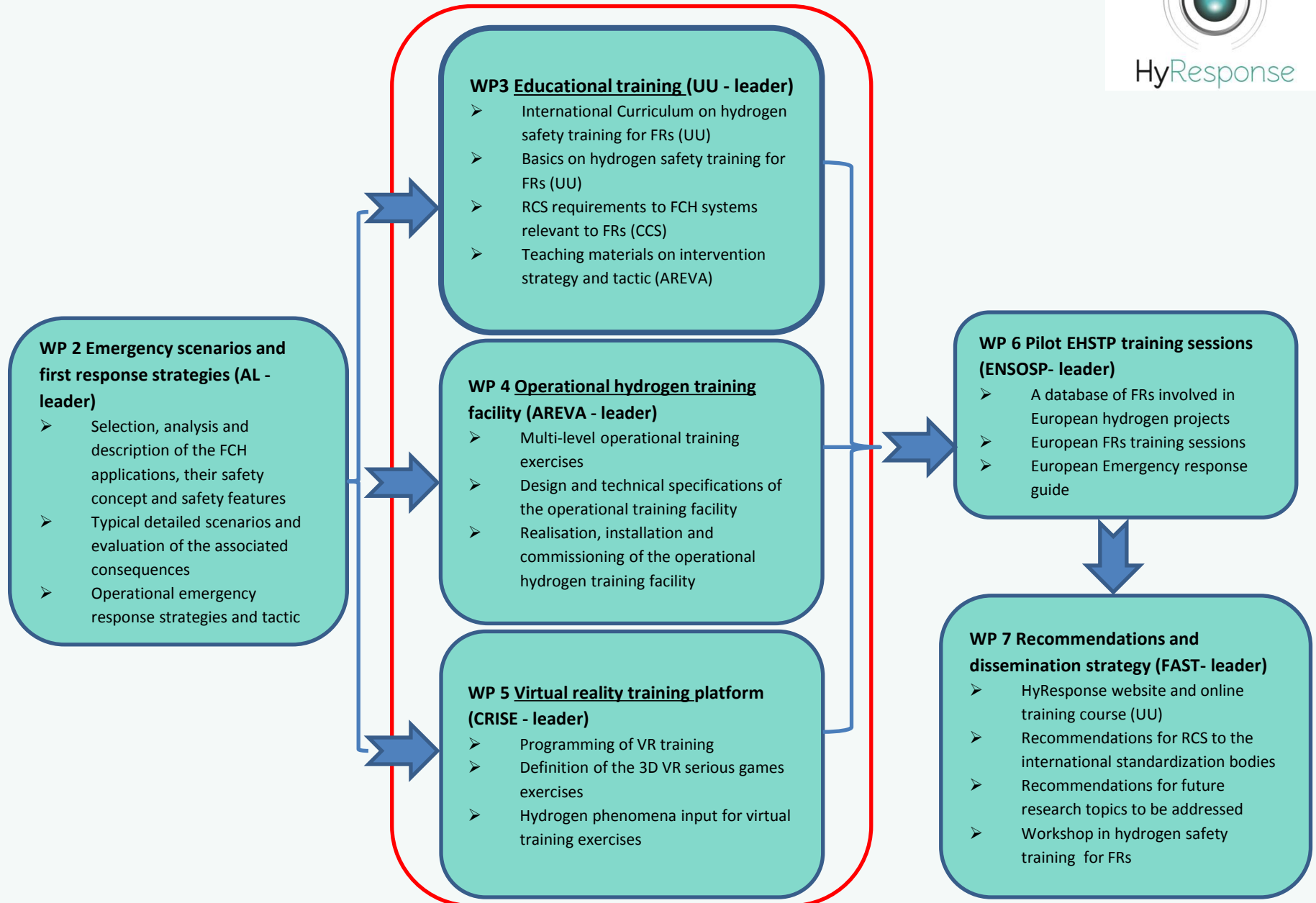


Three-fold training programme for First Responders (FRs)

- **Educational training** (UU - leader)
- **Operational-level training** on mock-up real scale transport and FCH stationary installations (AREVA)
- **Virtual reality training** exercises (CRISE)



HyResponse work plan



Target audience

First Responders:

- Fire-fighters
- Police
- Emergency medical personnel
- Site operators
- Vehicle recovery operators



Source: Google Images, 2014

Aim of educational training



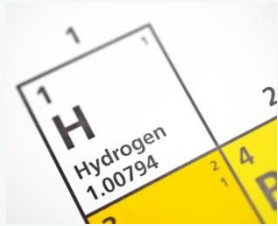
- Provide FRs with a **fundamental knowledge of hydrogen safety** prior to operational and virtual reality training

Benefits to FRs:

- A comprehension of **hydrogen specificities** and **hydrogen-related phenomena**
- Awareness of **safety issues** associated with **hydrogen physical and combustion properties**
- Knowledge of **potential hazards**, relevant **safety features** and **concepts of FCH systems**
- Awareness of **typical risk scenarios** for FCH systems
- Implementation of **correct intervention strategies and tactic**
- Clear picture on **safety requirements** prescribed in **RCS** with respect to **assessment of accident/incident scenes**; **mitigation measures**; **safety strategies** for the operation of FRs



International Curriculum on hydrogen safety training for First Responders (1/4)



- ❖ *A foundation* for the development of educational materials
- ❖ Developed to the maximum degree of detail possible
- ❖ Critical review of state-of-the-art in hydrogen safety science and engineering
- ❖ Essential reading list and further reading included
- ❖ Final version of the curriculum prepared in May 2014 (deliverable D3.1)
- ❖ Will be available on the project website

Three core sections:

❖ **Basics of Hydrogen Safety for FRs**



❖ **Regulations, Codes and Standards for FRs**



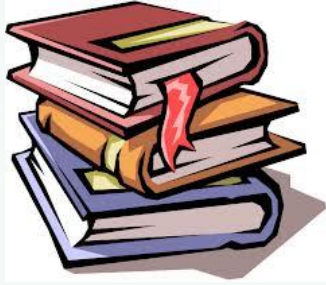
❖ **Intervention Strategies and Tactic for FRs**



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International Curriculum on hydrogen safety training for First Responders (2/4)



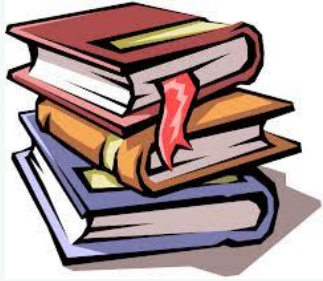
Section 'Basics of Hydrogen Safety for FRs'

9 modules; expected delivery time during pilot training sessions: 16-17 hours

- **Introduction to hydrogen safety for FRs** (overview of FCH applications, infrastructure and uses; specific safety issues related to hydrogen storage; overview of incidents/accidents involving hydrogen);
- **Properties of hydrogen relevant to safety** (basic properties and behaviour of hydrogen including combustion; comparison of hydrogen to common fuels);
- **Compatibility of hydrogen with different materials** (interactions of hydrogen with different substances);
- **Harm criteria for people and property** (hazards and risks associated with hydrogen);



International Curriculum on hydrogen safety training for First Responders (3/4)

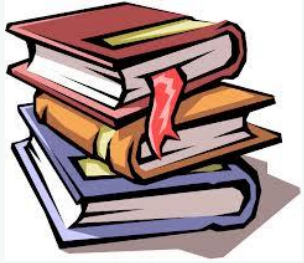


Section 'Basics of Hydrogen Safety for FRs'

- **Unignited hydrogen releases outdoors and their mitigation** (compressed hydrogen leaks; cryogenic leaks; mitigation measures);
- **Ignition sources and prevention of ignition** (ignition sources; mechanism of hydrogen ignition; spontaneous ignition; prevention measures);
- **Separation from hydrogen flames and firefighting** (hydrogen flames; jet fires; separation distances; radiation; fireballs; liquefied hydrogen fires; detection; mitigation and fire-fighting);
- **Dealing with hydrogen explosions** (deflagrations; detonations; blast waves; possible mitigation measures);
- **Hazards of hydrogen use indoors and relevant mitigation techniques** (hydrogen releases and dispersions indoors; natural and forced ventilation; pressure peaking phenomenon; regimes of indoors jet fires; self-extinction; external flame; hydrogen sensors and hydrogen fire detectors).



International Curriculum on hydrogen safety training for First Responders (4/4)



Section 'Regulations, Codes and Standards for FRs'

1 module; expected delivery time 1-1.5 hour during pilot training sessions

- Regulations, Codes and Standards for FRs
- Requirements of FCH systems relevant to FRs

Section 'Intervention Strategies and Tactic for FRs'

1 module; expected delivery time 1-1.5 hour during pilot training sessions

- Typical accident scenarios for selected FCH applications
- Relevant emergency response strategies and tactics
- Rescue operations



Pilot training sessions



- Three pilot training sessions will be organised in 2015 and 2016
- Each training session – 1 week duration
- Educational classes in the morning
- Operational and virtual reality classes in the afternoon
- 50 First Responders in face-to-face mode
- Developed educational materials will be evaluated by trainees using a feedback form
- ENSOSP facilities

Development of teaching materials



- Ongoing activity
- Educational materials: in intermediate form M21 (March 2015); in final form M36 (June 2016)
- A format suitable for an easy comprehension by FRs
- PowerPoint slides and word documents
- Videos of incidents/accidents if possible (database US DoE www.h2incidents.org and HySAFE <https://odin.jrc.ec.europa.eu/>)
- Small demonstrations of hydrogen releases and jet fires
- Teaching materials will be updated after a feedback received from trainees after 1st and 2nd pilot sessions



HyResponse website



- <http://www.hyresponse.eu/> (developed by UU; launched in November 2013)
- Free access to teaching materials
- Online interactive training

The screenshot shows the HyResponse website homepage. At the top, there's a navigation bar with the HyResponse logo and the text "European hydrogen emergency response training program for first responders". Below this is a horizontal menu with links: Home, Educational training, Operational training, VR training, Emergency Response Guide, Contacts, Events, Members, and Links. The main content area features a announcement about the "International Workshop on Hydrogen Safety Training for First Responders" scheduled for September 3rd and 4th, 2014, in ENSOSP, Aix en Provence (France). Below the announcement is a "Welcome to the HyResponse project's website" section, followed by a detailed paragraph about the project's goals and activities. At the bottom, there's a photograph of yellow hydrogen storage cylinders with a red warning sign that reads "HYDROGEN FLAMMABLE GAS NO SMOKING NO OPEN FLAME". The HySAFER logo is visible in the bottom right corner.

HyResponse project's webs... x

www.hyresponse.eu

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European hydrogen emergency response training program for first responders

HyResponse

Home Educational training Operational training VR training Emergency Response Guide Contacts Events Members Links

International Workshop on Hydrogen Safety Training for First Responders will take place on the 3rd and 4th of September 2014 at ENSOSP, Aix en Provence (France). The registration for the First International Workshop on Hydrogen Safety Training for First Responders is now open. All the details are available at: [First International Workshop on Hydrogen Safety Training for First Responders](#)

Welcome to the HyResponse project's website

HyResponse is a 'Coordination and Support Action (CSA)' project supported by EC Fuel Cell and Hydrogen Joint Undertaking and aiming to establish the World's first comprehensive training programme for first responders, i.e. a European Hydrogen Safety Training Platform (EHSTP), to facilitate safer deployment of FCH systems and infrastructure. The core training programme is threefold: educational training, including the state-of-the-art knowledge in hydrogen safety, operational training on mock-up real scale hydrogen and fuel cell installations, and innovative virtual reality training reproducing in detail an entire accident scenario, including influence of first responder's intervention. Three pilot training sessions will be organised during the project. The Emergency Response Guide, explaining details of intervention strategy and tactics, will be developed and included into the pilot training sessions to receive attendees' feedback. The Advisory and Consultative Panel will be established to engage as much as possible European stakeholders and provide highest outreach of the project results. The Panel membership will be open to first responders, site operators, representatives and hydrogen industry, and car manufacturers throughout Europe. A website will stay active for training of new comers after the end of the project. EHSTP will train first responders to deal with all safety aspects for a range of hydrogen applications, including passenger vehicles, buses, forklifts, refuelling stations, backup power, stationary fuel cells for combined production of heat and power, etc.

HYDROGEN
FLAMMABLE GAS
NO SMOKING
NO OPEN FLAME

HySAFER

Interactive online training course



Source: Google Images, 2014

- Videos of demonstrations, experiments or incidents/accidents
- Animation films
- News reports
- Photos, images, schemes etc.
- Links to relevant websites and other sources of information
- Materials will be available for translation
- To be available on HyResponse website (by the end of the project in May 2016)

Acknowledgement



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Thank you for listening!